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New Strategies of Traceability for Determining the Geographical Origin of Foodstuffs: Creation of a biological Bar-Code by PCR-DGGE

A. F. EL SHEIKHA[1, 2], D. MONTET[1]

[1]*Minufiya University, Faculty of Agriculture, Department of Food Science and Technology, 32511 Shibin El Kom, Minufiya Government, Egypt*

[2]*Centre de Coopération Internationale en Recherche Agronomique pour le Développement, CIRAD, UMR Qualisud, TA 95B/16, 34398 Montpellier Cedex 5, France*

Abstract

The determination of geographical origin is a demand of the traceability system of import-export foodstuff. One hypothesis of tracing the source of a product is by analyzing in a global way the microbial communities of the food and links statistically this analysis to the geographical origin of the food (Montet *et al.*, 2004). The molecular technique employing 26S rDNA profiles generated by PCR-DGGE was used to detect the variation in the yeast community structures of fruits (El Sheikha *et al.*, 2009). We applied this new technique on Physalis fruits from three countries (Egypt, Colombia, Uganda) and on shea tree from four countries (Cameroon, Mali, Senegal, Uganda). The DGGE gels showed some significant differences in the migration patterns. However, the duplicates for each sampling location gave statistically similar DGGE patterns throughout the study. We demonstrated that there was a link between the yeast populations and the geographical area. When the 26S rDNA profiles were analyzed by multivariate analysis, distinct microbial communities were detected. The band profiles from different countries were different and were specific for each country and could be used as a bar code to discriminate the origin of the fruits. This method is a new traceability tool which provides fruit products with a unique bar code and makes it possible to trace back the fruits to their original country.

Physalis is included in the priority list of many governments' horticulture and fruit export plan. It is exported from several countries including Colombia, Egypt, Zimbabwe and South Africa, but Colombia stands out as one of the largest producers, consumers and exporters. Colombia exports of Physalis in 2004 were worth 14 millions USD (El Sheikha *et al.*, 2008a). In Egypt, economical importance of Physalis is rising, due to, achieving a great success in local, Arabic and European markets (El Sheikha, 2004).

Physalis as the whole plant has many medicinal properties, including antipyretic, depurative, diuretic, pectoral, and vermifuge. A decoction is used in the treatment of abscesses, cough, fevers or sore throat (Duke and Ayensu 1985). The pulp is nutritious, containing particularly high levels of carotenoids, minerals, essential amino acids and vitamin C (El Sheikha *et al.*, 2008b).

Regarding shea tree fruits, only seven countries have statistics. Nigeria accounts for more than 60% of the production of shea butter in 2005. It is followed by Mali, Ghana and Burkina Faso, which together account for just under a third of world production in 2005. In Europe, shea butter is used mainly (95%) by the chocolate industry. The quantities exported to Japan, the United States or Switzerland would be mainly used for cosmetic or pharmacological (FAOSTAT, 2007).

Key words: Traceability, PCR-DGGE, Physalis, Shea tree fruits, Yeast communities, Origin